

Metrics for In-Space Telescope Assembly Techniques

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Abstract— Reliable metrics are not yet available for choosing between human and robotic assets for space-based construction and servicing of large space telescopes. Using FAIR-DART as a reference design, we generated example event sequences for telescope assembly scenarios in enough detail to identify infrastructure assumptions and technology requirements. A systems trade among human and robotic techniques (human EVA, on-site telerobotic, ground-in-the-loop robotic, commanded or sequenced robotic, and autonomous/decision-making robotic) helped us to define key metrics in the human-robotic trade space, including quality, time, cost, and risk. Our methodology included examining representative end-member scenarios. Case A treated each step in the assembly sequence as if all other steps have no on-site human involvement, and Case B treated each step as if human EVA is already involved in all other steps. With this trade, we identified key enabling technologies and infrastructure for space-based assembly and servicing of large space telescopes.